



Agilent X/P/K281C Adapters

**Including Options 006, 012,
013, 106**

Operating and Service Manual



Agilent Technologies

Notices

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Safety Earth Ground



This is a Safety Class I product (provided with a protective earthing terminal). An uninterruptible safety earth ground must be provided from the main power source to the product input wiring terminals, power cord, or supplied power cord set. Whenever it is likely that the protection has been impaired, the product must be made inoperative and secured against any unintended operation.

Before Applying Power

Verify that the product is configured to match the available main power source as described in the input power configuration instructions in this manual. If this product is to be powered by an autotransformer, make sure the common terminal is connected to the neutral (grounded) side of the ac power supply.

Contacting Agilent

For more information, please contact your nearest Agilent office.

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| | |
|---------------|----------------|
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| Switzerland(French) | 41 (21) 8113811 (Opt 2) |
| Switzerland(German) | 0800 80 53 53 (Opt 1) |
| United Kingdom | 44 (0) 118 9276201 |
| Other European Countries: | www.agilent.com/find/contactus |

Or, go to www.agilent.com/find/assist for more information.

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1

Introduction

Product Overview 8

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This chapter provides an overview of the Agilent X/P/K281C Adapters.



Product Overview

The X281C, P281C, and K281C adapters provide a convenient means of coupling between waveguide and coaxial systems. Power can be transmitted in either direction, and each adapter covers the full frequency range of its waveguide size. A step-like internal structure transforms the waveguide impedance to the 50 Ω impedance of the coaxial line.

Options

Option 006

Option 006 adds two alignment holes to the waveguide flange. The dimensions of the Option 006 alignment holes are provided in the following table.

Table 1-1 Option 006 Alignment Hole Measurement Dimensions

| Model | Alignment Hole Diameter "A" | Dimension "B" | Dimension "C" |
|-------|-----------------------------|---------------|---------------|
| X281C | 3.175 mm (+0.014 to 0.0) | 15.49 mm | 16.26 mm |
| P281C | 3.175 mm (+0.014 to 0.0) | 12.62 mm | 12.14 mm |
| K281C | 2.381 mm (+0.014 to 0.0) | 8.13 mm | 8.51 mm |

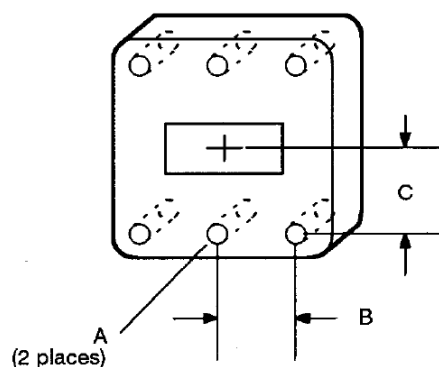


Figure 1-1 K281C Option 006 Waveguide Alignment Holes

Option 012

Option 012 for the X281C offers a Type-N (m) connector to replace the standard 7-mm connector.

Option 012 for the K281C offers a 3.5 mm (m) connector to replace the standard 3.5 mm (f) connector.

Option 013

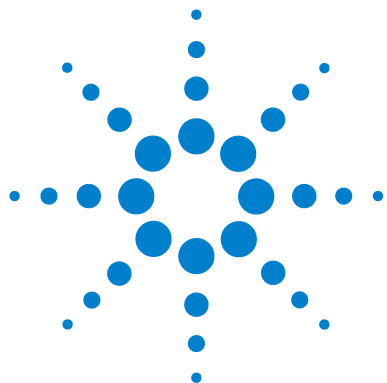
Option 013 for the X281C offers a Type-N (f) connector to replace the standard 7-mm connector. Option 013 is not offered for the K281C and the P281C.

Option 106

Option 106 is only available for the K281C. It replaces the standard 3.5 mm (f) connector with a 3.5 mm (m) connector and adds two alignment holes to the waveguide flange. The dimensions of the alignment holes are identical to Option 006 for the K281C as shown in [Table 1-1](#).

Instruments Covered by Manual

The adapters covered by this manual have a two part serial number. The first four digits and letter constitute the serial number prefix. The last five digits form the sequential suffix that is unique to each adapter. The contents of this manual apply to adapters prefixed at 3032A and above.



2 Installation

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| “Operating Procedure” | on page 13 |
| “Performance Test – SWR” | on page 14 |
| “Adjustments” | on page 14 |

This chapter provides you important information on how to check and prepare your instrument for operation.



Initial Inspection

- 1 Unpack and inspect the shipping container and its contents thoroughly to ensure that nothing was damaged during shipment. If the shipping container or cushioning material is damaged, the contents should be checked both mechanically and electrically. Check for mechanical damage such as scratches or dents.
- 2 If the contents are damaged or defective, contact your nearest Agilent Technologies Service and Support Office. Refer to “[Contacting Agilent](#)” in the front matter of this manual. Agilent Technologies will arrange for repair or replacement of the damaged or defective equipment. Keep the shipping materials for the carrier’s inspection.
- 3 If you are returning the instrument under warranty or for service, repackaging the instrument requires original shipping containers and materials or their equivalents. Agilent Technologies can provide packaging materials identical to the original materials. Refer to “[Contacting Agilent](#)” in the front matter of this manual for the Agilent Technologies nearest to you. Attach a tag indicating the type of service required, return address, model number, and serial number. Mark the container **FRAGILE** to assure careful handling. In any correspondence, refer to the instrument by its model number and serial number.

Operation and Safety Precautions

Observe the following guidelines before connecting or operating the adapter.

CAUTION

- Exceeding the allowable energy and power levels may result in damage to the adapter or associated equipment.
 - Care should be taken to protect the face of the flange from any damage that would prevent close surface-to-surface contact. Any burring, denting, or scratching may increase RF leakage and the reflection coefficient of the waveguide connection. The supplied plastic cover should be used to protect the flange when the adapter is not in use.
 - The power that can be handled will be a function of the size of the center conductor. The majority of the heat flow will be via conduction. The weak point is the coax portion. The waveguide portion is capable of higher power. These numbers are assuming an ambient temperature of 25 °C and an altitude of sea level. Higher ambient temperatures and altitude would degrade power-handling capability.
-

Operating Procedure

Use the following procedure when you connect an adapter to a waveguide.

- 1 Make sure the rectangular ports are oriented the same way; that is, not “cross-guided”.
- 2 Align ports carefully to minimize reflections.
- 3 Clamp or bolt flanges securely together so that pressure is evenly distributed over the contacting surfaces. Loose waveguide connections and flange distortion may result in leakage and mismatch.

Performance Test – SWR

The maximum SWR for the adapters are shown in [Table 3-1](#) and [Figure 3-1](#). When making these measurements, the test results must be less than those listed in [Table 3-1](#) plus the measurement uncertainty of the measuring system.

Measurements may be made using a standard reflectometer setup. To ensure satisfactory performance, make sure flanges and coaxial connectors are not damaged or worn.

Adjustments

Adjustments should not be made unless the adapter does not meet specifications, or unless the unit has been physically damaged.



3 Specification

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This chapter provides the specifications of the Agilent X/P/K281C Adapters.



General Specifications

Physical Specifications

| Model | X281C | P281C | K281C |
|------------------------|--|---------------------------------------|---------------------------------------|
| Net weight | 210 g (7.20 oz) | 110 g (4.0 oz) | 40 g (1.3 oz) |
| Dimensions: | | | |
| Length | 73 mm (2.9 in) | 52 mm (2.0 in) | 35 mm (1.4 in) |
| Width | 41 mm (1.6 in) | 33 mm (1.3 in) | 22 mm (0.9 in) |
| Height | 61 mm (2.4 in) | 55 mm (2.2 in) | 38 mm (1.5 in) |
| Waveguide size: | | | |
| Nominal outer diameter | 25.40 x 12.70 (mm) 1.00 x 0.50 (in) | 17.83 x 9.93 (mm) 0.70 x 0.39 (in) | 12.70 x 6.35 (mm) 0.50 x 0.25 (in) |

Specifications

Specifications refer to the performance standards or limits against which the adapter is tested.

Typical characteristics are included for additional information only and they are not specifications. These are denoted as “typical”, “nominal”, or “approximate” and are printed in italic.

Table 3-1 Specifications

| Model | X281C | P281C | K281C |
|-----------------------|-------------|-------------|-------------|
| Frequency range (GHz) | 8.2 to 12.4 | 12.4 to 18 | 18 to 26.5 |
| SWR* | < 1.05 | < 1.06 | < 1.07 |
| (Typical SWR) | (< 1.03) | (< 1.04) | (< 1.05) |
| Operating temperature | 0 to +55 °C | 0 to +55 °C | 0 to +55 °C |

Table 3-1 Specifications (continued)

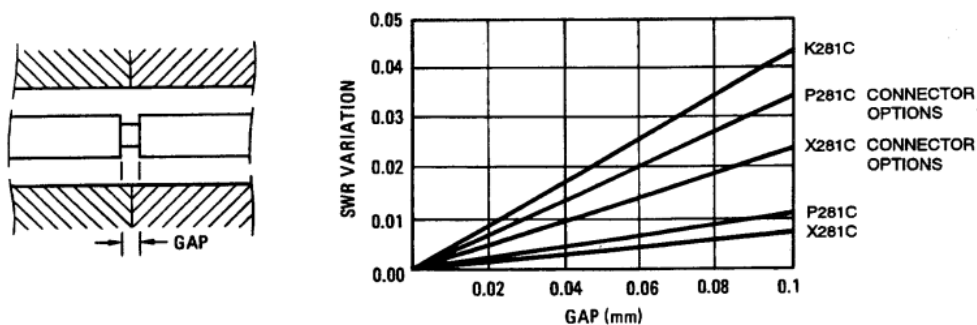
| Model | X281C | P281C | K281C |
|---------------------------------|--|---------------|------------------------------------|
| Typical insertion loss | 0.08 dB | 0.10 dB | 0.12 dB |
| Maximum peak power [†] | 200 W | 200 W | 100 W |
| EIA | WR90 | WR62 | WR42 |
| Equivalent flange type | UG-135/U | UG-419/U | UG-597/U |
| Alignment holes | 4 holes (6 holes for option 006 [‡]) | | |
| Connector type: | | | |
| Standard | 7-mm | 7-mm | 3.5 mm female |
| Option 012 | N-male | Not available | 3.5 mm male |
| Option 013 | N-female | Not available | Not available |
| Option 106 | Not available | Not available | 3.5 mm male with 6 alignment holes |

* Specifications in this table are measured with no gap between the full diameters of the male and female center conductors.

† The power that can be handled will be a function of the size of the center conductor. The majority of the heat flow will be via conduction. The weak point is the coax portion. The waveguide portion is capable of higher power. These numbers are assuming an ambient temperature of 25 °C and an altitude of sea level. Higher ambient temperatures and altitude would degrade power-handling capability.

‡ Option 006 is only available for the standard connector type.

Figure 3-1 shows the variation in SWR introduced by the center conductor gap.

**Figure 3-1** Typical SWR Variation Versus Center Conductor Gap

Mechanical Characteristic

Mechanical characteristics, such as center conductor protrusion and pin depth, are not warranted performance specifications.

They are however important supplemental characteristics related to the electrical performance of the devices.

Pin Depth

Pin depth is the distance that the center conductor mating plane differs from being flushed with the outer conductor mating plane. The pin depth of a connector can be in one of two states, protruding or recessed.

Figure 3-2, Figure 3-3, and Figure 3-4 show a visual representation of proper pin depth for connector types for standard and option models.

Table 3-2 Connector Types for Standard and Options

| Model | X281C | P281C | K281C |
|---------------------|---------------|---------------|---------------|
| Standard/Option 006 | 7-mm | 7-mm | 3.5 mm female |
| Option 012 | N-male | Not available | 3.5 mm male |
| Option 013 | N-female | Not available | Not available |
| Option 106 | Not available | Not available | 3.5 mm male |

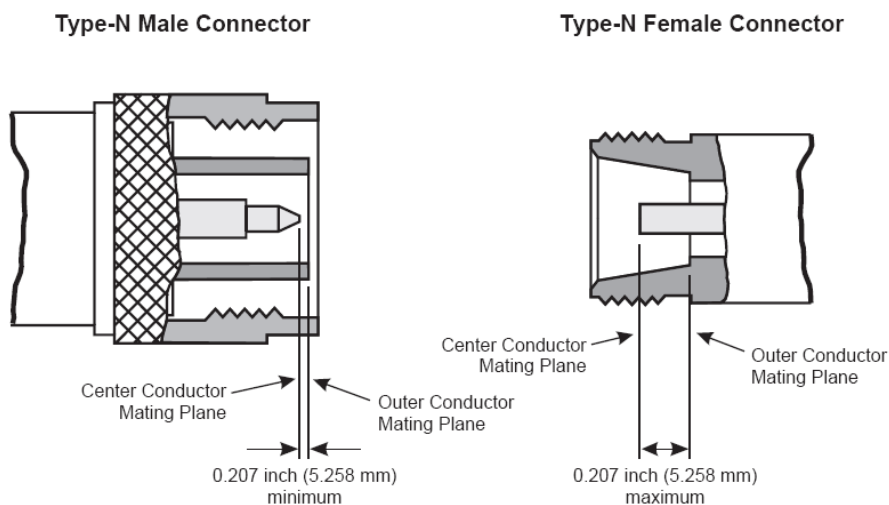


Figure 3-2 Type-N Connectors

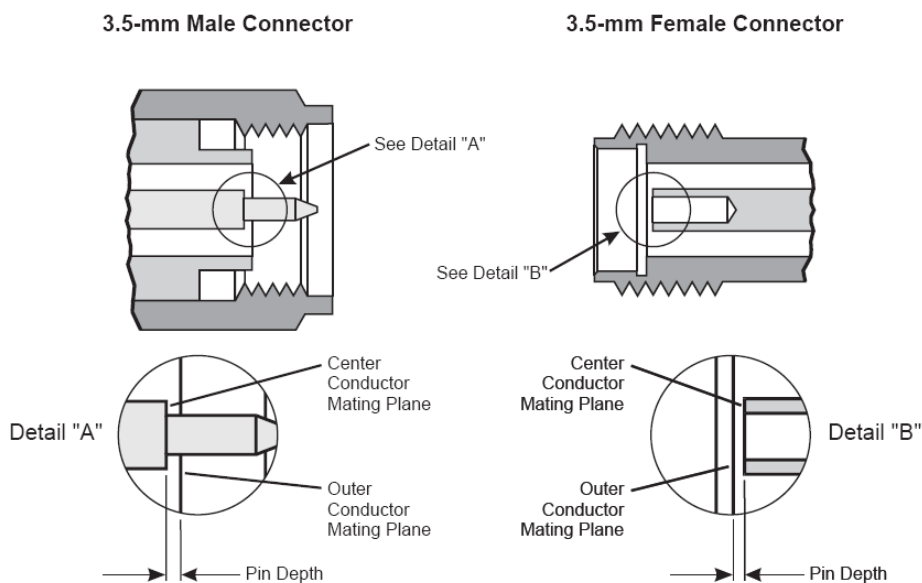


Figure 3-3 3.5-mm Connectors

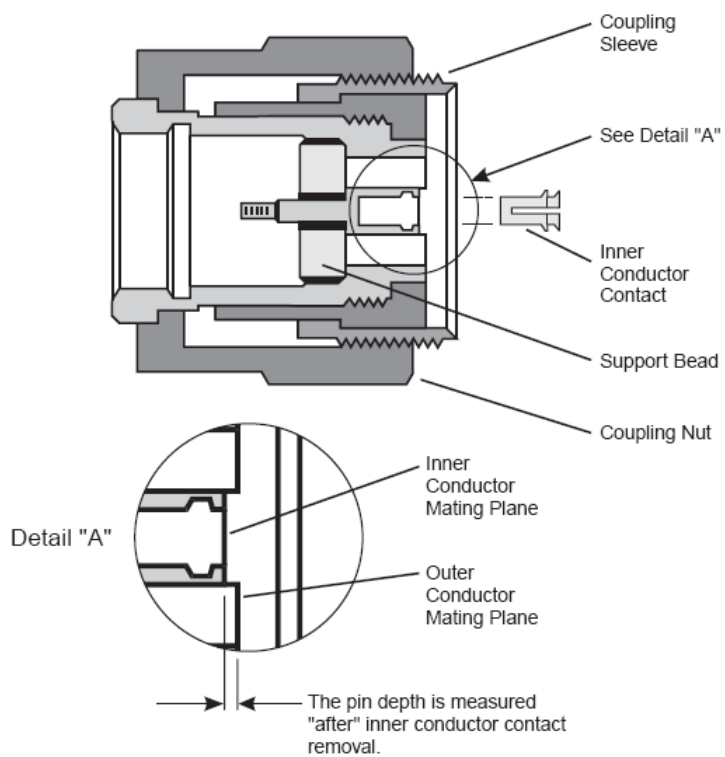


Figure 3-4 7-mm Connector

Environmental Specifications

The Agilent X/P/K281C adapters are designed to fully comply with Agilent Technologies's product operating environmental specifications. The following are the summarized environmental specifications for these adapters.

Table 3-3 Agilent X/P/K281C Environmental Specifications

| | |
|------------------------------|------------------------|
| Temperature | |
| • Operating | 0 °C to 55 °C |
| • Storage/Shipment | –55 °C to 75 °C |
| Relative Humidity | |
| • Operating/Storage/Shipment | <95% relative at 40 °C |
| Altitude | |
| • Operating | <4600 m (15000 ft) |
| • Storage/Shipment | <15000 m (50000 ft) |

Store the adapters in a clean, dry environment.

Safety and Regulatory Markings

| | |
|---|--|
|  | This symbol indicates that you should refer to the instrument's instruction manual for important information. |
|  | This symbol indicates hazardous voltages. |
|  | The laser radiation symbol is marked on products that have a laser output. |
|  | This symbol indicates that the instrument requires alternating current (ac) input. |
|  | The CE mark is a registered trademark of the European Community. If it is accompanied by a year, it indicates the year the design was proven. |
|  N10149 | The C-Tick mark is a registered trademark of the Australian Spectrum Agency. |
|  | The CSA mark is a registered trademark of the Canadian Standards Association. |
| ISM1-A | This text indicates that the instrument is an Industrial Scientific and Medical Group 1 Class A product (CISPER 11, Clause 4). This ISM device complies with Canadian ICES-001. Cet appareil ISM est conforme a la norme NMB du Canada |
|  | This symbol indicates that the power line switch is ON. |



This symbol indicates that the power line switch is OFF or in STANDBY position.

Declaration of Conformity

A copy of the Manufacturer's Declaration of Conformity for this instrument can be obtained by contacting your local Agilent Technologies sales representative.



4 Service Information

Service Information [26](#)

[“Replacing the Center Conductor Contact”](#) on page 26

Replaceable Parts [27](#)

This chapter provides service instructions and lists the available replaceable parts for the Agilent X/P/K281C Adapters.



Service Information

Replacing the Center Conductor Contact

Not all parts on the adapters are replaceable, but all of the adapters have a replaceable center conductor contact.

When you replace the center conductor contact, observe the following precautions:

- Before installing the new center conductor contact, apply Loctite sealant #222 to the threads of the center conductor.
- Do not use excessive force when tightening center conductor parts.

Model K281C (All Options)

To replace the center conductor, you will need a 5/64 inch hexagonal nut driver.

In some units, the center conductor mounting hole was made oversized to allow for a slight adjustment. When the center conductor is replaced in these units, it may be necessary to readjust and retest if the unit does not meet specifications.

If the mounting hole appears to be oversized, mount the center conductor toward one end of the adapter as far as it will go. If the adapter fails the performance test, move the center conductor toward the opposite end and then retest.

Replaceable Parts

Replaceable parts for the P281C adapter are shown below. Refer to [Table 4-1](#), [Table 4-2](#), and [Table 4-3](#) for identification of parts and corresponding part numbers for all models. For ordering information, contact the nearest Agilent office listed in “[Contacting Agilent](#)” in the front matter of this manual.

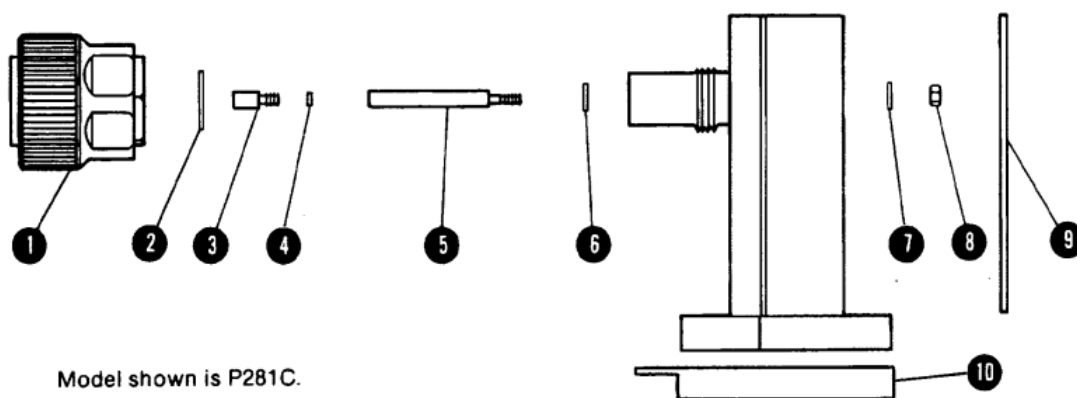


Figure 4-1 Replaceable Parts

NOTE

[Table 1-1](#) on page 8 gives dimensional tolerances for Option 006 that can be expected to yield satisfactory results. It may be necessary to try various combinations of spacers and shims to obtain proper dimensions. The use of at least one shim is recommended because of electro-chemical differences between the connector body and the adapter body. Refer to the appropriate table of replaceable parts for the thickness of shims and spacers.

CAUTION

Take care to avoid damaging parts. Burring, scratching, denting, or deforming parts may impair operating characteristics.

Table 4-1 X281C Replaceable Parts

| Description | Part Number |
|----------------------------------|---|
| X281C Standard/Option 006 | |
| Connector body | 1250-1466 |
| Spacer | 00281-20027 (0.05 mm), or 00281-20028 (0.075 mm), or 00281-20049 (0.025 mm) |
| Center conductor contact | 85050-20001 (G-slotted) 85130-20002 (collet holder) |
| Shim | 5020-8540 (0.013 mm), or 5020-8541 (0.025 mm) |
| Center conductor | Not replaceable |
| Spacer | Not replaceable |
| Washer | Not replaceable |
| Nut | Not replaceable |
| Blank label | Not replaceable |
| Flange cap | 5040-0354 |
| X281C Option 012 | |
| Connector body | 1250-0916 (Male) 1250-0918 (Nut) 1250-0016 (Ring) |
| Spacer | 00281-20027 (0.05 mm), or 00281-20028 (0.075 mm), or 00281-20049 (0.025 mm) |
| Center conductor contact | 5180-0988 |
| Shim | 5020-8540 (0.013 mm), or 5020-8541 (0.025 mm) |
| Center conductor | Not replaceable |
| Spacer | Not replaceable |

Table 4-1 X281C Replaceable Parts (continued)

| Description | Part Number |
|--------------------------|---|
| Washer | Not replaceable |
| Nut | Not replaceable |
| Blank label | Not replaceable |
| Flange cap | 5040-0354 |
| X281C Option 013 | |
| Connector body | 1250-0914 |
| Spacer | 00281-20027 (0.05 mm), or 00281-20028 (0.075 mm), or 00281-20049 (0.025 mm) |
| Center conductor contact | 5180-0854 |
| Shim | 5020-8540 (0.013 mm), or 5020-8541 (0.025 mm) |
| Center conductor | Not replaceable |
| Spacer | Not replaceable |
| Washer | Not replaceable |
| Nut | Not replaceable |
| Blank label | Not replaceable |
| Flange cap | 5040-0354 |

Table 4-2 P281C Replaceable Parts

| Description | Part Number |
|----------------------------------|---|
| P281C Standard/Option 006 | |
| Connector body | 1250-1466 |
| Spacer | 00281-20027 (0.05 mm), or 00281-20028 (0.075 mm), or 00281-20049 (0.025 mm) |
| Center conductor contact | 85050-20001 (G-slotted) 85130-20002 (collet holder) |
| Shim | 5020-8540 (0.013 mm), or 5020-8541 (0.025 mm) |
| Center conductor | Not replaceable |
| Spacer | Not replaceable |
| Washer | Not replaceable |
| Nut | Not replaceable |
| Blank label | Not replaceable |
| Flange cap | 5040-0358 |

Table 4-3 K281C Replaceable Parts

| Description | Part Number |
|------------------------------------|--|
| K281C Standard/Option 006 | |
| Connector body | 1250-1507 |
| Spacer | 5021-9679 (0.013 mm), or 5021-9680 (0.025 mm), or 5021-9681 (0.051 mm) |
| Center conductor contact | 00281-20043 |
| Spacer | 000281-20045 |
| Washer | 3050-0261 |
| Nut | 0608-0003 |
| Blank label | Not replaceable |
| Flange cap | 5040-0357 |
| Required but not Supplied | |
| 5/64 inch hexagonal nut driver | |
| K281C Option 012/Option 106 | |
| Connector body | 1250-1509 |
| Spacer | 5021-9679 (0.013 mm), or 5021-9680 (0.025 mm), or 5021-9681 (0.051 mm) |
| Center conductor contact | 00281-20044 |
| Spacer | 000281-20045 |
| Washer | 3050-0261 |
| Nut | 0608-0003 |
| Blank label | Not replaceable |
| Flange cap | 5040-0357 |
| Required but not Supplied | |
| 5/64 inch hexagonal nut driver | |

Table 4-3 K281C Replaceable Parts (continued)

| Description | Part Number |
|------------------------------|-------------|
| Miscellaneous Items | |
| Loctite #222 | 0470-0573 |
| Operating and Service Manual | 00281-90043 |